HISTORY

The Natural Setting

A parched and forbidding wilderness to those who first see it, the northwestern Mojave Desert is a land of coyotes and kangaroo rats, of ragged greasewood and, of course, Joshua trees. It is a harsh land of sometimes stunning contrasts—a land of griddle-hot days and bone-chilling nights, of violent dust storms, bewildering mirages and mesmerizing sunsets.

Until the Southern Pacific Railroad arrived in 1876, the desert was populated mostly by occasional prospectors drifting endlessly in pursuit of elusive mineral wealth. In 1882, the Santa Fe Railroad ran a line westward out of Barstow toward Mojave and built a water stop at the edge of an immense dry lakebed, roughly 20 miles southeast of Mojave. The lonely water stop was known simply as "Rod," and the lakebed was then called Rodriguez Dry Lake.

By the early 1900s, "Rodriguez" had been anglicized into "Rodgers," which was then shortened to "Rogers." First formed in the Pleistocene Epoch and featuring an extremely flat, smooth and concrete-like surface, Rogers Dry Lakebed is a playa—or pluvial lake—that spreads out over 44 square miles, making it the largest such geological formation in the world.

Its parched clay and silt surface undergoes a timeless cycle of renewal each year, as water from winter rains is swept back and forth by desert winds, smoothing it out to an almost glass-like flatness.

The Corum's tiny one-room general store eventually grew into the Muroc Mercantile Company and Post Office, a landmark at Muroc until 1953.

• The Homesteaders 1900's

In 1910, the Corum family settled at the edge of this lakebed. In addition to raising alfalfa and turkeys, they located other homesteaders in the area for a fee of $1 per acre. As those settlers moved in, the Corum brothers earned contracts for drilling water wells and clearing land. They also opened a general store and post office.

Their request to have the post office stop named "Corum" was disallowed because there was already a Coram, Calif. So they simply reversed the spelling of their name and named it "Muroc." Small, isolated homesteads dotted the land over the next 20 years.

• The Airmen Arrive 1930's

The early homesteaders thought of Rogers Dry Lakebed as a wasteland. However, a visionary airman commanding March Field, Lt. Col. H.H. "Hap" Arnold, saw it as a one-of-a-kind "natural aerodrome"—one that could be acquired at virtually no cost to the taxpayer.

Thus, in September 1933, the Muroc Bombing and Gunnery Range was established by Arnold. This remote training site, now a small enclave within present-day Edwards, served the Army Air Corps' bombers and fighters for several years.

With the arrival of World War II, a permanent base sprang up for the training of combat flight crews. In July 1942, it was activated as a separate post and designated Muroc Army Air Base.

Throughout the war years, B-24s thundered through the Muroc skies and P-38s strafed the targets on the range as bomber crews and fighter pilots prepared to do battle overseas.

Muroc Bombing and Gunnery Range, 1963

• Strange Shapes in the Sky 1940's

In the meantime, wartime development of military aviation overwhelmed Wright Field in Ohio with an immense volume of flight test work. It was necessary to find a remote location with good flying weather where a new top-secret airplane could safely undergo tests.

In the spring of 1942, a site was chosen alongside the north shore of Rogers Dry Lakebed, about six miles away from the training base at Muroc. A wooden hangar and rudimentary facilities sprang up and on Oct. 1, 1942, Bell test pilot Bob Stanley lifted the wheels of the Bell XP-59A Airacomet off the enormous, flat surface of the dry lakebed. The turbojet revolution had arrived. America's first jet plane was shortly joined by a second, the famed Lockheed XP-80 Shooting Star.

As revolutionary as these two experimental fighter planes were, the natural runways of the lakebed served them well. The first-generation turbojet engines had a nasty habit of flaming out, and the Airacomet required an extremely long takeoff roll.

During the postwar years, all of America's first generation of jets—both Air Force and Navy—underwent testing at Muroc, and the great lakebed served as a welcome haven to countless pilots in distress.

The success of these programs attracted a new type of research activity to the base in late 1946. The rocket-powered Bell X-1 was the first in a long series of experimental airplanes designed to prove or disprove aeronautical concepts—to probe the most challenging unknowns of flight and solve its mysteries.

On Oct. 14, 1947, Capt. Charles E. "Chuck" Yeager flew the small bullet-shaped airplane to become the first human to exceed the speed of sound. With the X-1, flight testing at Muroc began to assume two distinct identities. Highly experimental research programs—such as the X-3, X-4, X-5 and XF-92A—were typically flown in conjunction with the National Advisory Committee for Aeronautics, or NACA, and were conducted in a methodical fashion to answer largely theoretical questions. Then, as now, the great bulk of flight testing at Muroc focused on evaluations of the capabilities of aircraft and systems proposed for the operational inventory.

In December 1949, Muroc was renamed Edwards Air Force Base in honor of Capt. Glen W. Edwards, who was killed a year earlier in the crash of the YB-49 Flying Wing.

By that time, the base had already become the reigning center of American flight research and on June 25, 1951, this fact was finally officially recognized when its test community was designated the U.S. Air Force Flight Test Center, or AFFTC. That same year, the U.S. Air Force Test Pilot School moved to Edwards from Wright Field, Ohio.

Its curriculum focused on the traditional field of performance testing and the relatively new field of stability and control, which had suddenly assumed critical importance with the dramatic increases in speed offered by the new turbojets.

Capt. Glen W. Edwards

Below, the Bell XP-59A Airacomet rolls out for its maiden flight, ushering in the turbojet revolution.

Below, Capt Charles "Chuck" Yeager and the supersonic mission's project engineer, Capt. Jack Ridley, stand before the Bell X-1 hanging beneath the mothership B-29.

• The Golden Age of Flight Test 1950's

The decade of the1950s was a remarkable period in the history of aviation, and there was no better evidence of this than what transpired at Edwards. If the concept seemed feasible—or even just desirable—it was evaluated in the skies above the sprawling 301,000-acre base.

The experimental rocket planes, for example, continued to expand the boundaries of the high-speed and stratospheric frontiers.

As the decade opened, the first-generation X-1 reached Mach 1.45 (957 mph) and a 71,902-foot altitude, representing the edge of the envelope. The D-558-II Douglas Skyrocket soon surpassed these marks. In 1951, Douglas test pilot Bill Bridgeman flew it to a top speed of Mach 1.88 (1,180 mph) and a peak altitude of 74,494 feet. Then, in 1953, Marine test pilot Lt. Col. Marion Carl flew the same plane to an altitude of 83,235 feet.

On Nov. 20, 1951, NACA's Scott Crossfield became the first man to reach Mach 2 as he piloted the Skyrocket to a speed of Mach 2.005 (1,291 mph). Less than a month later, Maj. Chuck Yeager topped this record as he piloted the second-generation Bell X-1A to a top speed of Mach 2.44 (1,650 mph) and, just nine months later, Maj. Arthur "Kit" Murray flew the same airplane to a new altitude record of 90,440 feet.

These records stood for less than three years. In September 1956, Capt. Iven Kincheloe became the first man to soar above 100,000 feet, as he piloted the Bell X-2 to a then-remarkable altitude of 126,200 feet. Flying the same airplane just weeks later on Sept. 27, Capt. Mel Apt became the first to exceed Mach 3, accelerating to a speed of Mach 3.2 (2,094 mph). His moment of glory was tragically brief, however. Just seconds after attaining top speed, the X-2 tumbled violently out of control and Apt was never able to recover.

With the loss of the X-2, the search for many of the answers to the riddles of high-Mach flight had to be postponed until the arrival of the most ambitious of the rocket planes—the truly awesome North American X-15.

Meanwhile, the turbojet revolution had reached a high plateau at Edwards, as aircraft such as the famed "Century Series" of fighters—the F-100 Super Sabre, F-102 Delta Dagger, the Mach 2 F-104 Starfighter, F-105 Thunderchief and F-106 Delta Dart—made supersonic flight seem almost commonplace.

Incorporating many advances made possible by the experimental research programs, each of these aircraft was a dazzling technological achievement and, indeed, as a group, they defined the basic speed and altitude envelopes for fighters, which are still in effect to this day.

The "Century Series" Fleet of turbojet fighters in flight, including the F-100, F-101, F-102 and F-104.
1957 NASA photo

Capt. Milburn G. "Mel" Apt sits in the cockpit of the X-2. Next to him is Capt. Iven C. Kincheloe.
1956

X-15A with test pilot, Pete Knight.
1965 NASA photo

It fell to Maj. Robert M. "Bob" White to explore some of the new X-15's remarkable capabilities. He launched from a B-52 mother aircraft on March 7, 1961, and using only 50 percent of the thrust of his XLR99 rocket engine, became the first pilot to exceed Mach 4. In subsequent flights, Maj. White became the first to break Mach 5 and 6 as well. It had taken mankind nine years to get from Mach 1 to Mach 3 (1947-1956); White and the X-15 rocketed past the next three Mach numbers in just eight months.

• The Space Age

1960's

The 1960s ushered in a new emphasis on space flight. The Test Pilot School, for example, was re-designated the Aerospace Research Pilot School as it moved into the business of training future astronauts.

High above the flightline, the X-15 was beginning to explore hypersonic and exoatmospheric flight. Indeed, in July 1962, it became the first—and, so far, only—airplane to fly in near space as it soared above 314,000 feet, winning astronaut wings for its pilot, Maj. Robert M. White. With Maj. William J. "Pete" Knight at the controls on Oct. 3, 1967, the highly modified X-15A-2 ultimately reached a top speed of Mach 6.72 (4,520 mph), which remains the highest speed ever attained by an airplane.

While space-related activities captured the public's imagination, test pilots at Edwards were also continuing to expand the frontiers of atmospheric flight in air-breathing, jet-powered aircraft such as the XB-70 Valkyrie and the YF-12 and SR-71 Blackbird. The mammoth, 500,000-pound Valkyrie proved itself capable of sustained triple-sonic flight operations at altitudes above 70,000 feet.

In the meantime, the mysterious Blackbirds, now described as first-generation "stealth" aircraft, provided even more dazzling performances as they routinely cruised at speeds in excess of Mach 3 and at altitudes well above 80,000 feet.

With the decline of the military manned space mission in the early 70s, the Aerospace Research Pilot School was once again re-designated the U.S. Air Force Test Pilot School. This change was more than symbolic. Based on a survey of graduates still active in the flight test business, the school completely revamped its curriculum to reflect major changes that had recently taken place in the aerospace world.

Experience had shown that the proliferation of increasingly sophisticated onboard avionics, sensor and fire-control systems would be a constant and that supervising modern test programs would increasingly require strong management skills. Thus, the school replaced its space-oriented phase of curriculum with a whole new battery of courses focusing on systems tests and test management.

The Space Shuttle Discovery's drag chute deploys to slow its landing.
2002 NASA photo

A block 30 F-16 from the 416th Flight Test Squadron drops a Joint Direct Attack Munition (JDAM) during testing.
Photo by Tom Reynolds

• The Modern Skies

1970's New aircraft types arrived in the 1970s: the F-15 Eagle with its advanced engine and fire-control system; the single-engine F-16 Falcon with its revolutionary "fly-by-wire" flight control system; and the B-1 Lancer with its multitude of highly sophisticated offensive and defensive systems.

These planes more than bore out the prophecy concerning the ever-increasing importance of systems testing and integration. Moreover, another major new element of complexity was soon introduced into the flight test process.

At a remote location in 1978 and 1979, an AFFTC test pilot and a pair of flight test engineers were engaged in proof-of-concept testing with Lockheed's "low-observable" technology demonstrator, dubbed "Have Blue." The successful conduct of these tests led immediately to the development of a new subsonic attack aircraft that was designated the F-117A Nighthawk.

Another aerospace revolution—the stealth revolution—was underway.

1980's The 1980s opened with one of the most dramatic episodes in all of Edwards' history. At 10:20 a.m. on April 14, 1981, the wheels of the Space Shuttle Columbia touched down on Rogers Dry Lakebed. Astronauts John Young and Robert Crippen had successfully landed the first orbiting space vehicle ever to leave the Earth under rocket power and return on the wings of an aircraft. The era of reusable space vehicles had dawned.

In the meantime, flight testing itself had evolved into a remarkably complex process that led to a similar revolution in the Flight Test Center's ability to acquire and process flight data. In fact, the extraordinary number of costly flying hours required to test and integrate all of the new systems under the traditional "fly-fix-fly" method had forced the AFFTC to rethink its whole approach to the business of testing. Thus, the decade also saw the development of sophisticated new facilities at Edwards that met the challenges of the new technologies.

The Integration Facility for Avionic Systems Test, the Benefield Anechoic Facility and the Test and Evaluation, Modeling and Simulation Facility—all part of the Avionics Test and Integration Complex, permitted the testing and integration of new and complex software-intensive systems on the ground before they were taken into the air.

Spectacular events have become almost commonplace at Edwards over the years, but they have always represented only a small part of the Flight Test Center's workload. The primary job has always been to assure that American aircrews go into combat with the most effective and reliable operational aircraft in the world.

The capabilities of existing aircraft such as the F-15 and F-16 have been continually refined and expanded, even as totally new aircraft and systems incorporating radical new technologies are developed for future operational use.

The dual-role F-15E, for example, was developed in the 1980s and went on to demonstrate truly remarkable combat effectiveness in the Persian Gulf conflict of the early 90s. The Low Altitude Navigation and Targeting Infrared for Night, or LANTIRN, system revolutionized air-to-ground combat operations during the same conflict by denying our adversary the once comforting sanctuary of night.

The late 1980s also witnessed the arrival of the first giant flying wing to soar over the base in nearly 40 years. The thin silhouette, compound curves and other low-observable characteristics of the B-2 Spirit represented third-generation stealth technology, following the SR-71 and F-117.

A Global Hawk Unmanned Aerial Vehicle.

F-22 Raptor

• Where We Stand Today

Flight testing at Edwards has come a long way since the first olive-drab XP-59A lifted off from the lakebed more than 60 years ago. Over the years, the U.S. Air Force and the world of aerospace have continued to meet the future in the clear blue skies above the base. Every single aircraft to enter the Air Force's inventory—and a great many that failed to do so—has been put through its paces at Edwards, as well as Navy and Army aircraft.

Arguably, more major milestones in flight have occurred at this base than anywhere else in the world. The demands of the global war against terrorism and the ever-accelerating pace of technological change over the past half-century has been daunting, but the Edwards flight test community repeatedly demonstrates its ability to adapt to these changes and to master the many challenges they impose.

The turbojet revolution, the space revolution, the systems revolution and now the stealth revolution have imposed seemingly insurmountable obstacles. Each barrier, however, has been overcome through a combination of technical skill, daring ingenuity and skillful management.

Indeed, the Air Force Flight Test Center's unique blend of natural, technical and human resources has transformed it into something much more than just a benefit to the Air Force; it is an irreplaceable national asset.

1990's and beyond

The new bomber, by far the most sophisticated and complex airplane ever built, was soon followed in the early 90s by the arrival of the YF-22A and the YF-23A, both of which would soon give a new definition to the term "air superiority."

The two prototype fighters were the first airplanes to blend stealth with agility and high-speed, supersonic cruise capability. The YF-22A was selected to become the Air Force's new advanced tactical fighter after a brief demonstration and validation risk reduction flight test program. Now named the Raptor, the F/A-22 is undergoing evaluation at the AFFTC.

A new group of research projects came to Edwards in the 1990s. Global Hawk, an unmanned aerial vehicle that has been used extensively in Afghanistan as well as Iraq, made its first flight at Edwards in February 1998 and has gone on to fill a critical role in America's war on terrorism. The X-24, X-33, X-34 and X-38, a series of new lifting bodies, technology demonstrators and half scale models that might make space flight, research and development safer and more economical, were tested here by NASA during the decade.

The new millennium brought new projects with worldwide impact. The X-35A and X-32A, competing models for the Joint Strike Fighter program, made their first flights in September and October 2000. The X-35A won the competition in 2001 and will eventually be built in various versions for America's flying armed services and for foreign air forces as well. Also new is the Airborne Laser Program, currently undergoing development and modifications at Edwards.

The X-35 Joint Strike Fighter is disassembled at Edwards AFB and placed on a truck headed for the Smithsonian Institute's National Air and Space Museum in Washington, DC.
U.S. Air Force Photo by Thomas Powel